Abstract

Chimeric antigen receptor (CAR T) cell therapy is currently a successful treatment for hematological malignancies and is also a rapidly evolving field of research for treating solid tumors. The potential clinical expansion of this therapy depends on overcoming many obstacles, such as the persistence of CAR T cells in the hostile tumor microenvironment, induced toxicities, or the need for the transplant to be autologous. These limitations can be mitigated by CRISPR-Cas9 gene editing, which has the potential to create CAR T cells resistant to inhibition, modulate cytokine release, decrease the risk of cytokine release syndrome or neurotoxicity, and create allogeneic CAR T cells that do not cause graft-versus-host disease. Improvements in the CRISPR-Cas9 technology field, such as the development of base and prime editors, further increase safety by bypassing the dangerous double-strand break in the genome. Although many of these modifications are still subjects of research, there are a number of ongoing or already completed clinical trials that have implemented CRISPR-Cas9 technology in their CAR T cell engineering processes.